

WE CLAIM:

1. A process for manufacturing composite parts of given thickness, comprising reinforcement fibers which are parallel to at least one preferred direction of reinforcement, said fibers being embedded in a matrix based on a composition comprising a resin which can be hardened by ionizing irradiation, the process comprising the following stages:

- arranging said reinforcement fibers substantially parallel to one plane and impregnating them with said composition;
- exposing the composition containing said fibers, in a layer of thickness less than said given thickness, to ionizing irradiation, in order partially to polymerize the resin and to obtain a precomposite in which said composition is in a solid phase;
- taking lengths from the precomposite and applying them to a support, the surface of which is non-planar in shape, by stacking them on one another in a number dictated by said given thickness, and by causing them to fit snugly against said shape of the support, and thus to create a stack of stressed lengths;
- subjecting the stack to final molding at a suitable pressure and temperature to continue the polymerization of the resin and to join the different lengths of precomposite.

1 2. A process according to Claim 1, in which the surface of the support
2 is developable.

1 *Sub A* 3. A process according to Claim 1, in which, considering a minimum
2 radius of curvature "r" of said composite part, the start of prepolymerization is effected in
3 a layer of thickness "e" is such that "e" is smaller than $r/20$.

1 4. A process according to Claim 1, in which, considering the
2 minimum radius of curvature "r" of said composite part, the start of prepolymerization is
3 effected in a layer of thickness "e" is such that "e" is smaller than $r/150$.

1 *Sub B* 5. A process according to Claim 1, in which said lengths of
2 precomposite are stacked and deformed individually to make them each fit snugly in
3 succession against said shape of the support.

1 6. A process according to Claim 1, in which said lengths of
2 precomposite are stacked and deformed in groups of several lengths to make them fit
3 snugly collectively against said shape of the support.

1 7. A process according to Claim 1, in which the temperature during
2 the molding under pressure in the final molding stage is higher than the glass transition
3 temperature T_g of the composition of the precomposite.

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irradiation is s

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1 18. A process according to Claim 16, in which said composition
2 comprises a monomer which can be copolymerized with the resin and the viscosity of
3 said composition is adjusted by varying the proportion of monomer.

1 Sub
a27 19. A process according to Claim 18, in which said monomer is styrene.

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p1 20. A process according to Claim 1, in which said composition
2 comprises a polymerization photoinitiator and the irradiation lies within the visible
3 ultraviolet spectrum.

1 21. A process according to Claim 16, in which said composition
2 comprises a polymerization photoinitiator which is bis(2,4,6-trimethylbenzoyl)-
3 phenylphosphine oxide and the irradiation lies within the visible ultraviolet spectrum.

1 22. A process according to Claim 1, in which the reinforcement fibers
2 are selected from the group comprising high-tenacity polyacrylic fibers, oxidized
3 polyacrylonitrile fibers, high-tenacity polyvinyl alcohol fibers, aromatic polyamide fibers,
4 polyamide-imide fibers, polyimide fibers, chlorofibers, high-tenacity polyester fibers,
5 aromatic polyester fibers, high-tenacity polyethylene fibers, high-tenacity polypropylene
6 fibers, cellulose fibers, rayon fibers, high-tenacity viscose fibers, polyphenylene
7 benzobisoxazol fibers, polyethylene naphthenate fibers, glass fibers, carbon fibers, silica
8 fibers and ceramic fibers.

1 23. A process according to Claim 20, in which a glass fiber is used.

1 *Sub B17* 24. A process according to Claim 1, in which a layer of composition
 2 based on sulphur-vulcanizable elastomer is interposed between some of the lengths of
 3 precomposite.

1 25. A process according to Claim 24 in which, on the surface of each
 2 length intended to receive a layer of composition based on sulphur-vulcanizable
 3 elastomer, there is deposited a layer of resorcinol formaldehyde latex glue (RFL), said
 4 layer of RFL glue being dried without reaching a temperature of greater than 100°C,
 5 before receiving said layer of composition based on sulphur-vulcanizable elastomer.

1 26. A process according to Claim 24, including, in the final molding
 2 stage, joining the layers of the stack, vulcanizing the composition based on sulphur-
 3 vulcanizable elastomer, polymerizing completely the resin and joining the composition
 4 based on sulphur-vulcanizable elastomer and the resin.

1 27. A process according to Claim 1, using unidirectional fibers parallel
 2 to the said at least one preferred direction of reinforcement, arranged substantially parallel
 3 during impregnation by said composition.

1 *Sub B17* 28. A stratified composite material of non-planar form, comprising
 2 reinforcement fibers parallel to at least one preferred direction of reinforcement, each
 3 fiber being entirely contained in a single stratum, said fibers being embedded in a matrix
 4 based on a composition comprising a resin which can be hardened by ionizing irradiation,

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 6 in which each stratum is of a thickness of less than 0.3 millimeters, in which the glass
 7 transition temperature T_g of the matrix is greater than 150°C, and in which the Shore D
 8 hardness of the material is greater than 80.

1 29. A material according to Claim 28, in which the surface of each
 2 stratum is of non-planar, developable form.

1 30. A material according to Claim 28, in which the modulus of flexure
 2 is greater than 30000 MPa, the breaking stress upon flexure is greater than 1000 MPa, and
 3 the breaking stress under shear is greater than 70 MPa.

1 31. A material according to Claim 28, in which the resin is selected
 2 from the group consisting of unsaturated vinylester resins and polyester resins.

1 32. A material according to Claim 28, in which the resin is an epoxy
 2 resin.

1 33. A material according to Claim 31, in which said composition
 2 comprises a monomer which can be copolymerized with the resin.

1 *Sub A3*
 2 34. A material according to Claim 33, in which said monomer is
 3 styrene.

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1 35. A material according to Claim 28, in which said composition
2 comprises a polymerization photoinitiator and the irradiation lies within the visible
3 ultraviolet spectrum.

1 36. A material according to Claim 28, in which said composition
2 comprises a polymerization photoinitiator which is bis(2,4,6-trimethylbenzoyl)-
3 phenylphosphine oxide and the irradiation lies within the visible ultraviolet spectrum.

1 37. A material according to Claim 28, in which the reinforcement
2 fibers are selected from the group consisting of glass fibers and carbon fibers.

1 38. A material according to Claim 28, in which, between at least some
2 of said strata, there is interposed a layer of composition based on sulphur-vulcanizable
3 elastomer.

1 39. A material according to Claim 38, in which, between at least some
2 of said strata and said layer of composition based on sulphur-vulcanizable elastomer,
3 there is interposed a layer of resorcinol formaldehyde latex glue (RFL).

1 40. A material according to Claim 28, in which the reinforcement
2 fibers are unidirectional fibers.

1 *Sub B17* 41. A precomposite prepared in a great length and in a width of less
 2 than 0.3 millimeters, comprising reinforcement fibers which are parallel to at least one
 3 preferred direction of reinforcement, said fibers being embedded in a matrix based on a
 4 composition comprising a resin which can be hardened by ionizing irradiation, in which
 5 the glass transition temperature T_g of the matrix is between 40°C and 130°C, and in
 6 which the Shore D hardness of this precomposite is between 50 and 65, coated with a
 7 protective film opaque to visible ultraviolet irradiation.

1 42. A precomposite according to Claim 41, in which the resin is
 2 selected from the group consisting of unsaturated vinylester resins and polyester resins.

1 43. A precomposite according to Claim 41, in which the resin is an
 2 epoxy resin.

1 44. A precomposite according to Claim 42, in which said composition
 2 comprises a monomer which can be copolymerized with the resin.

1 *Sub B17* 45. A precomposite according to Claim 44, in which said monomer is
 2 styrene.

1 *Sub B17* 46. A precomposite according to Claim 41, in which said composition
 2 comprises a polymerization photoinitiator and the irradiation lies within the visible
 3 ultraviolet spectrum, and in which the coating is opaque to visible ultraviolet irradiation.

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1 47. A precomposite according to Claim 42, in which said composition
2 comprises a polymerization photoinitiator which is bis(2,4,6-trimethylbenzoyl)-
3 phenylphosphine oxide and the irradiation lies within the visible ultraviolet spectrum.

1 48. A precomposite according to Claim 41, in which the reinforcement
2 fibers are selected from the group consisting of glass fibers and carbon fibers.

1 49. A precomposite according to Claim 41, in which the reinforcement
2 fibers are unidirectional fibers.

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